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EXT BYND 6 YRS BY SAME
REASON 3 a (3)

PROTOTYPE INSPECTION REPORT

UPI-10

[redacted]

50X1

15 May 1953

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1. INTRODUCTION:

Two prototype models of the UPI-10, Serial Nos. 4 and 7 were received by the Analysis and Appraisal Unit of the Research and Development Branch of Comms Engineering for prototype approval testing. This report contains both the results of these tests and the conclusions derived therefrom.

2. SUMMARY

The UPI-10 is a vibrator type power inverter designed especially to power the RS-6 and the RS-1 from 220 volt DC mains. A DC line cord and ground lead are permanently connected to the unit. An AC output receptacle, an ON-OFF switch, and a line fuse are the only other external controls and fittings. A complete set of operating instructions is engraved into the front panel.

Since it was felt that at some future date the UPI-10 might be considered as a possible power source for AC gear other than the RS-1 and RS-6, unity power factor regulation tests were conducted on the units in addition to the tests required by Specification No. 52-A-1024-A.

3. Mechanical Section:

3.1. Size and Weight:

Size----------2 3/4" X 5" X 7 1/2"
Weight----------6 pounds, 2 ounces.

3.2. Mechanical Inspection:

A mechanical inspection of the unit disclosed only one undesirable condition. Two wires, one of which was a DC line conductor, were pinched between the transformer core and the case. The manufacturer has been made cognizant of the existence of this hazard and has indicated that he will re-route the two conductors to avoid the possibility of a recurrence of this condition.

4. Electrical Section:

4.1. Electrical Tests:

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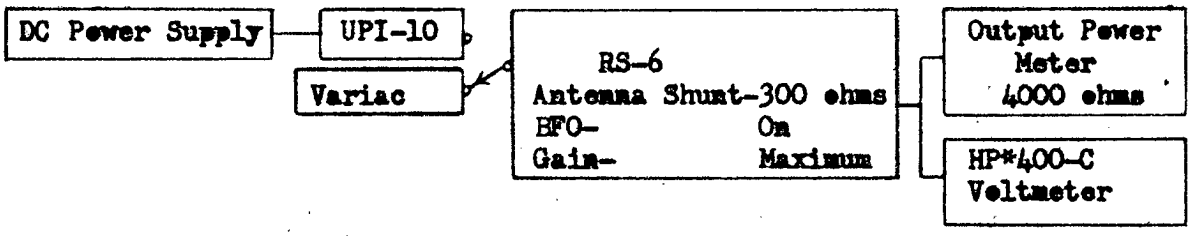
4.1.1. RS-6 Operational Noise Test

F (Mc/s)	RS-6 Noise Output (Micro-watts)			
	Prototype #4		Prototype #7	
	AC Mains	UPI-10	AC Mains	UPI-10
3.0	40.0	105.6	4.9	90.0
4.0	36.1	90.0	4.9	75.6
5.0	32.1	90.0	4.9	62.5
6.5	22.5	62.5	4.9	40.0
6.5	16.9	44.1	22.2	40.0
7.0	14.4	32.1	22.5	40.0
8.0	12.1	22.5	19.6	22.5
9.0	10.0	22.5	12.1	16.9
10.0	9.0	19.6	10.0	19.6
11.0	8.1	16.9	8.1	14.4
12.0	7.25	15.6	12.1	12.1
13.0	6.4	15.6	14.4	10.0
14.0	6.4	15.6	16.9	8.1
15.0	6.4	14.4	16.9	8.1



The above test was conducted in a screened room.

During the AC Line portion of the test, the RS-6 plate voltage was held constant to the same value as during the UPI-10 portion so as not to change the receiver sensitivity. (380 volts DC)

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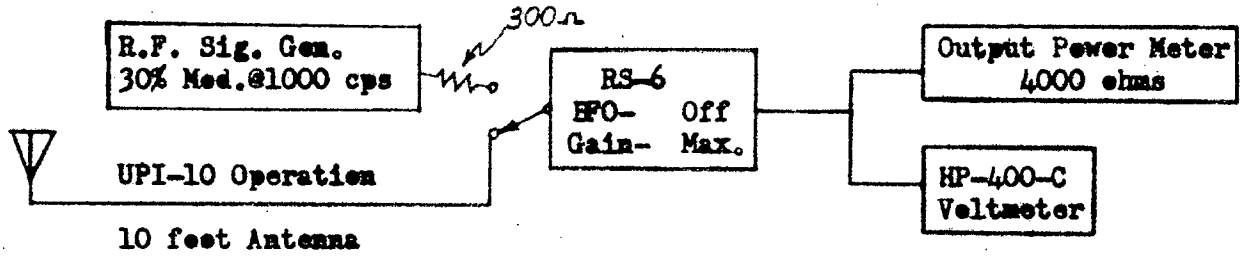
4.1.2. Equivalent Noise Input to the RS-6

F (Mc/s)	Equivalent Input (Micro-volts)
3.0	Less Than 0.2
4.0	" " "
5.0	" " "
6.0	" " "
6.5	" " "
6.5	" " "
7.0	" " "
8.0	" " "
9.0	0.9
10.0	0.2
11.0	0.2
12.0	0.26
13.0	2.0
14.0	3.5
15.0	3.7

Line Operation



The above test was conducted in a screened room.

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4.1.3. Radiated and Conducted Interference

F (Mc/s)	Radiated Interference (Micro-volts/meter) Prototype #7	Prototype #4	Conducted Interference (Micro-volts) Prototype #7	Prototype #4
0.15	160	400	70.0	175.0
0.2	120	280	90.0	200.0
0.4	100	280	45.0	175.0
0.7	80	280	6.75	30.0
1.0	55	160	3.75	35.0
1.5	40	40 or less	1.8	1.8
2.0	40 or less	40 " "	1.8	1.8
4.0	40 " "	40 " "	2.5	2.75
7.0	40 " "	40 " "	3.25	3.25
10.0	40 " "	40 " "	3.5	2.5
15.0	40 " "	40 " "	4.5	3.0
20.0	40 " "	40 " "	4.75	7.5
25.0	40 " "	140	9.5	7.5

The above readings were taken in a screened room on a ground plane in accordance with JAN-I-225, using a Steddart NM-20-A Field Intensity Meter.

Minimum Radiated Interference Measurable----40 micro-volts/meter
Minimum Conducted Interference Measurable---1.8 micro-volts

4.1.4. RS-6 Noise Output

F (Mc/s)	RS-6 Noise Output (Milli-watts) UPI-10 #4	UPI-10 #7
3.0	0.15	0.15
4.0	0.25	0.15
5.0	0.15	0.15
6.0	0.5	0.20
6.5	0.2	0.20
6.5	0.4	0.26
7.0	0.4	0.25
8.0	0.6	0.25
9.0	0.25	0.25
10.0	0.3	0.5
11.0	0.3	0.25
12.0	0.25	0.5
13.0	0.25	0.5
14.0	0.5	0.6
15.0	0.5	0.75

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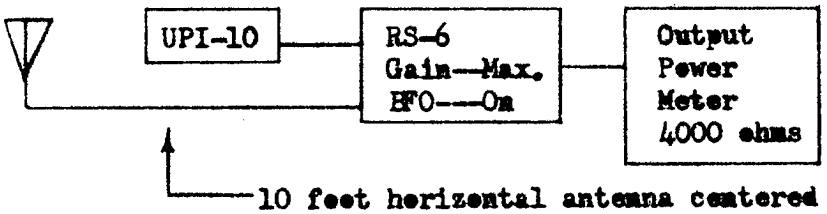
4.1.4. Continued



10 feet horizontal antenna centered over and 2 feet above the UPI-10 in a screened room.

4.1.5. RS-6 Plate Voltage

Prototype #4

Transmitter B/ (Key up-AC line 220 volts) - - - - - - - - - - 380 volts DC
Transmitter B/ (Key up-UPI-10 220 volt DC Line) - - - - - - - 375 volts DC

Prototype #7

Transmitter B/ (Key up-AC line 220 volts) - - - - - - - - - - 378 volts DC
Transmitter B/ (Key up-UPI-10 220 volt DC Line) - - - - - - - 374 volts DC

4.1.6. UPI-10 Frequency

When powering the RS-6, the UPI-10 frequency was found to be very close to 60 c/s as indicated by a stationary 1 to 1 ratio Lissajou pattern on an oscilloscope whose horizontal sweep was line driven.

4.1.7. Regulation With Unity Power Factor Load

Line Voltage (Volts DC)	Line Current (Ma. DC)	Input Power (Watts)	Load (Watts)	Load Current (Ma. RMS)	Load Voltage (Volts RMS)	Efficiency (%)
Prototype #7						
220	45	9.9	0	0	266	0
220	113	24.9	20	80	248	65
220	232	51.0	40	155	240	74.9
220	345	75.9	60	257	238	77.2
220	370	81.4	65	283	228	79.9
220	465	102.3	80	365	222	78.4
Prototype #4						
220	42	9.2	0	0	266	0
220	140	30.8	20	60	255	65
220	243	53.5	40	150	243	74.9
220	269	59.1	45	173	242	75.1
220	350	79.2	60	260	232	75.8
220	385	84.7	65	280	232	76.9

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4.1.8. Regulation With Line Fluctuation

Line Voltage (Volts DC)	Line Current (Ma. DC)	Input Power (Watts)	Load (Watts)	Load Current (MA. RMS)	Load Voltage (Volts RMS)	Efficiency (%)
200	351	70.2	55	250	210	81.0
220	385	84.7	65	280	233	76.8
240	420	100.8	78.8	310	257	73.0

4.1.9. Voltage Waveshapes

The various waveshapes from two prototypes using the original and spare vibrators, under various load conditions can be seen in the photographs at the conclusion of this report.

5. Conclusion:

The test results indicate that the UPI-10 prototypes #4 and #7 meet the requirements of Specification No. 52-A-1024-A.

It is recommended that before subsequent production runs, the manufacturer should attempt to reduce vibrator hash in the RS-1 and RS-6 frequency range below what it is at present.

In addition, during the present production run it is recommended that he check every vibrator for closure time and contact bounce by means of an oscilloscope. The waveshape photographs indicate that contact bounce occured in Prototype #2 using the original vibrator.

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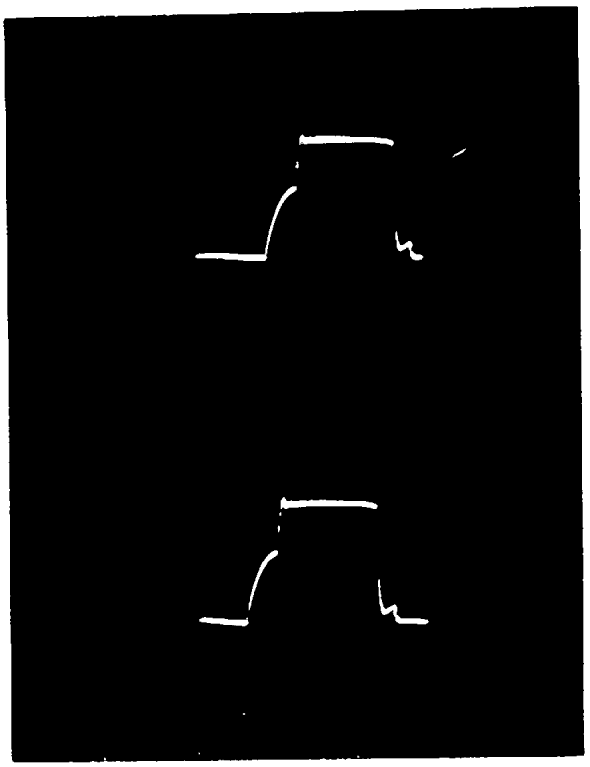
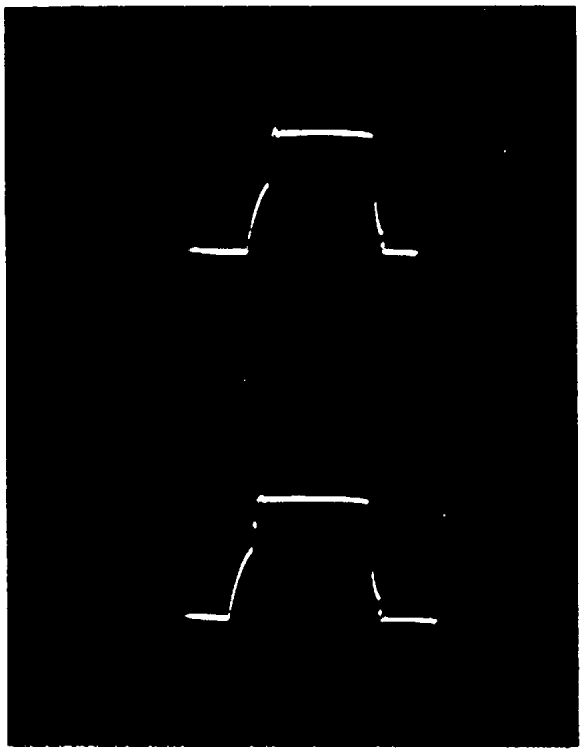


VOLTAGE WAVESHAPE
Prototype #1
RS-6 Load
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
RS-6 Load
Replacement Vibrator

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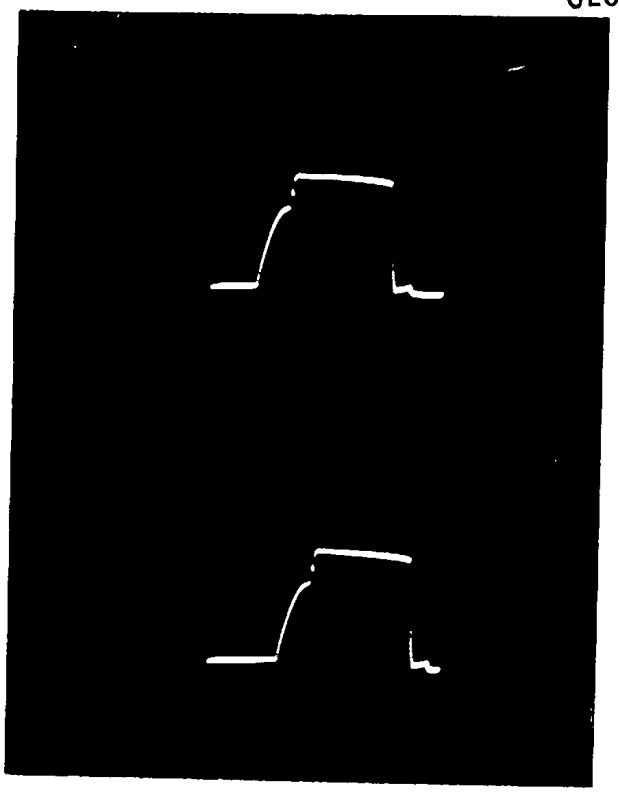
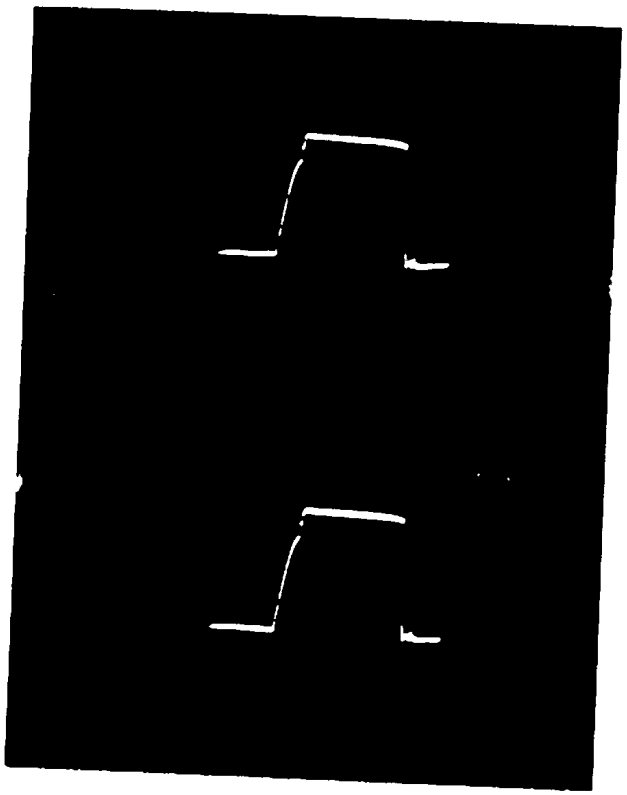


VOLTAGE WAVESHAPE
Prototype #1
RS-1 Load
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
RS-1 Load
Replacement Vibrator

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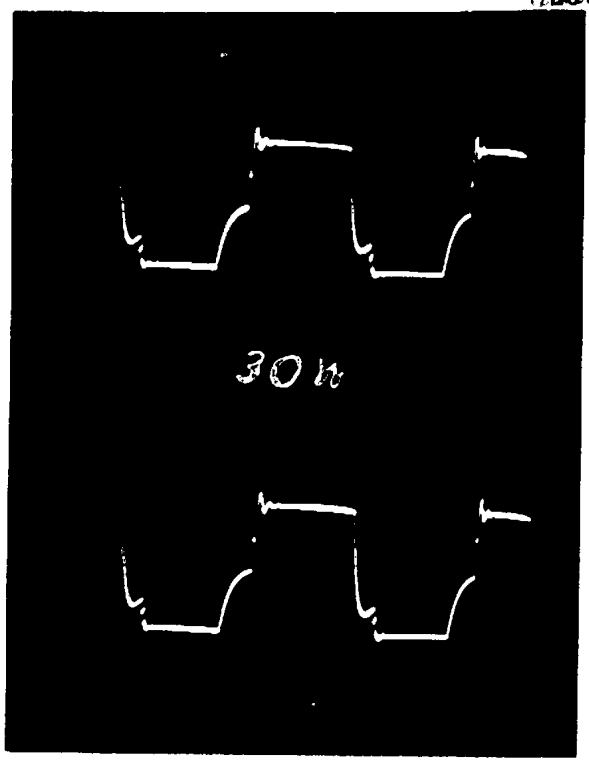
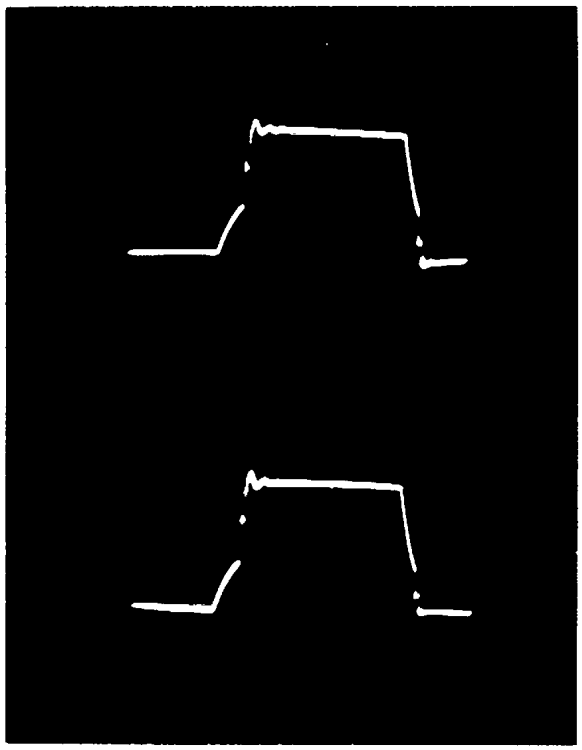


VOLTAGE WAVESHAPE
Prototype #1
30 Watt Load, Unity P.F.
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
20 Watt Load, Unity P.F.
Replacement Vibrator

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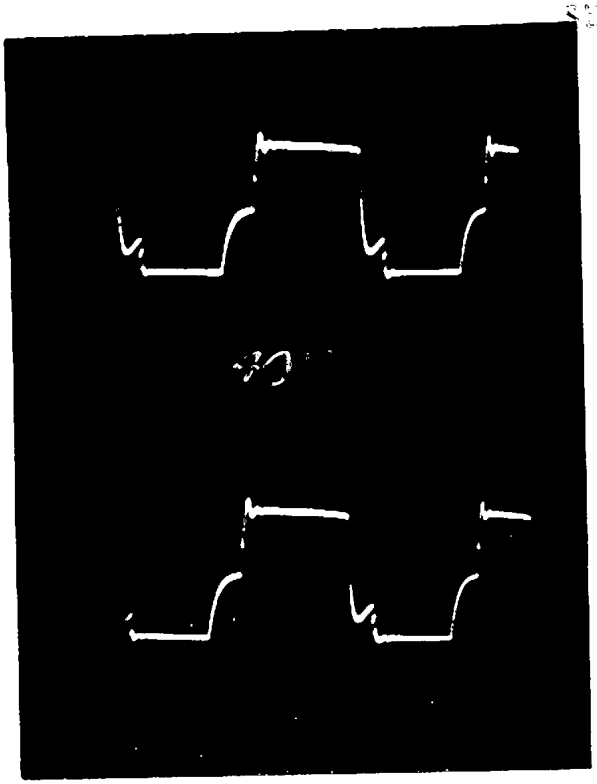
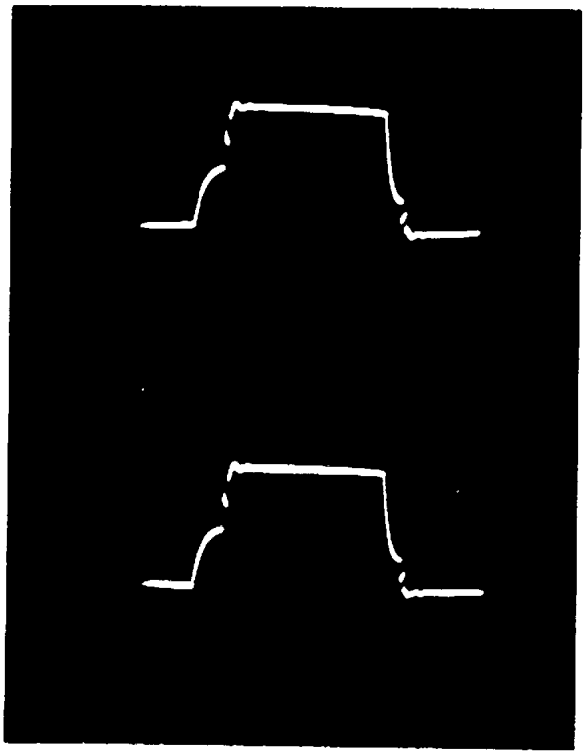


VOLTAGE WAVESHAPE
Prototype #1
40 Watt Load, Unity P.F.
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
50 Watt Load, Unity P.F.
Replacement Vibrator

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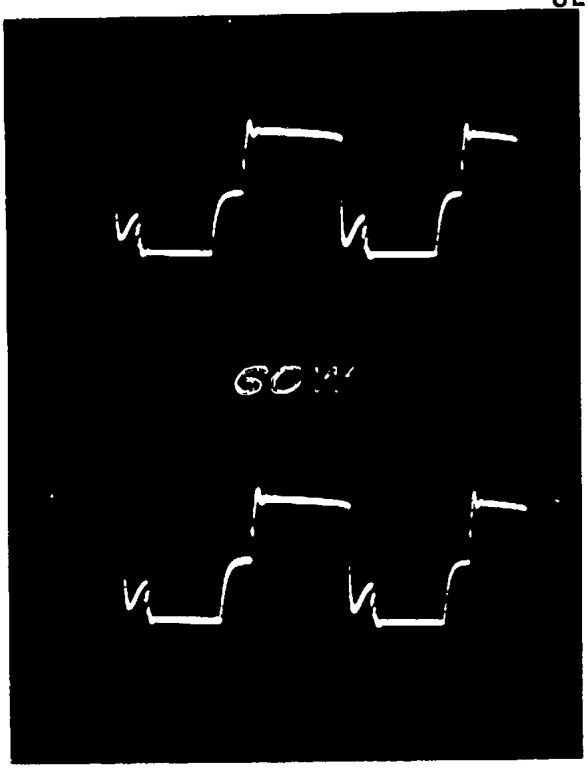
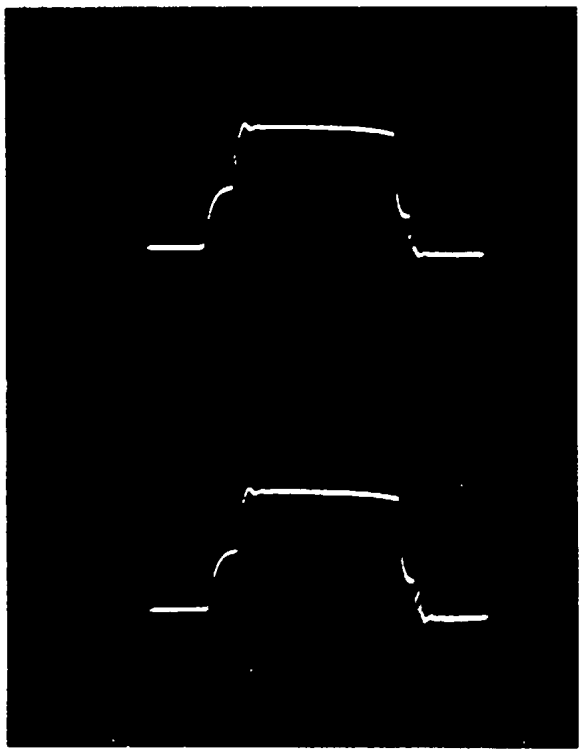


VOLTAGE WAVESHAPE
Prototype #1
60 Watt Load, Unity P.F.
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
65 Watt Load, Unity P.F.
Replacement Vibrator

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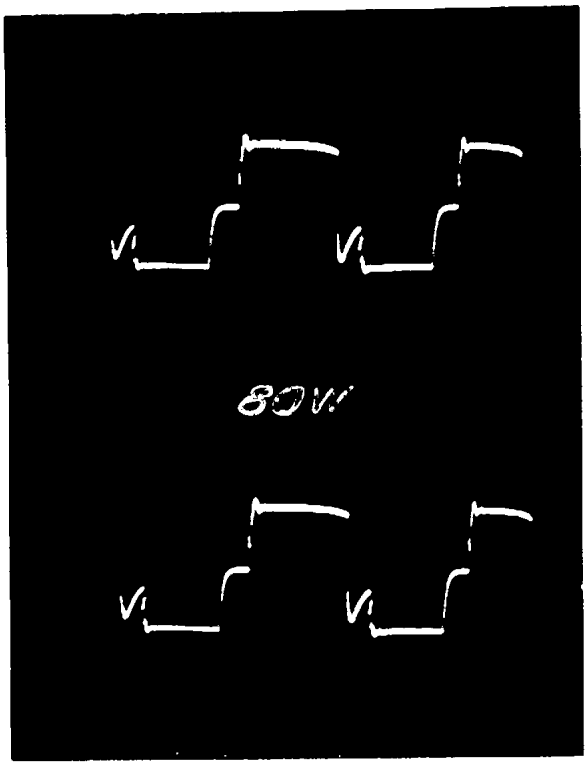
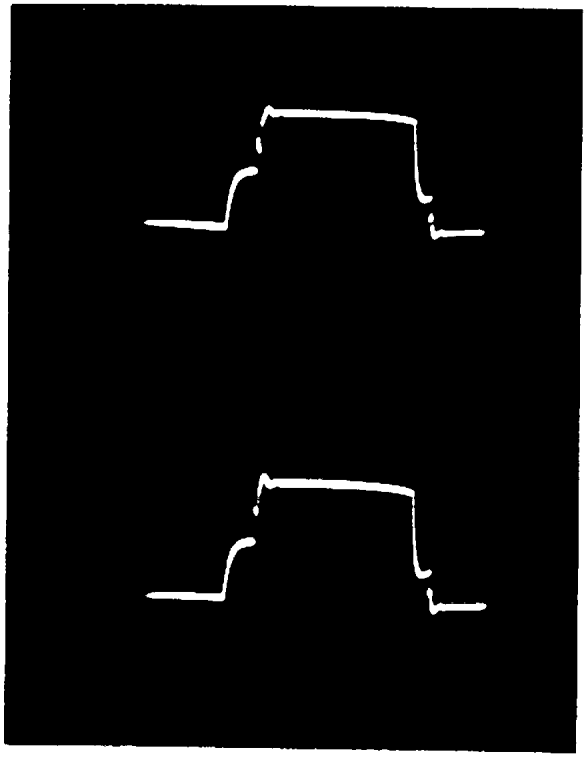


VOLTAGE WAVESHAPE
Prototype #1
80 Watt Load, Unity P.F.
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
80 Watt Load, Unity P.F.
Replacement Vibrator

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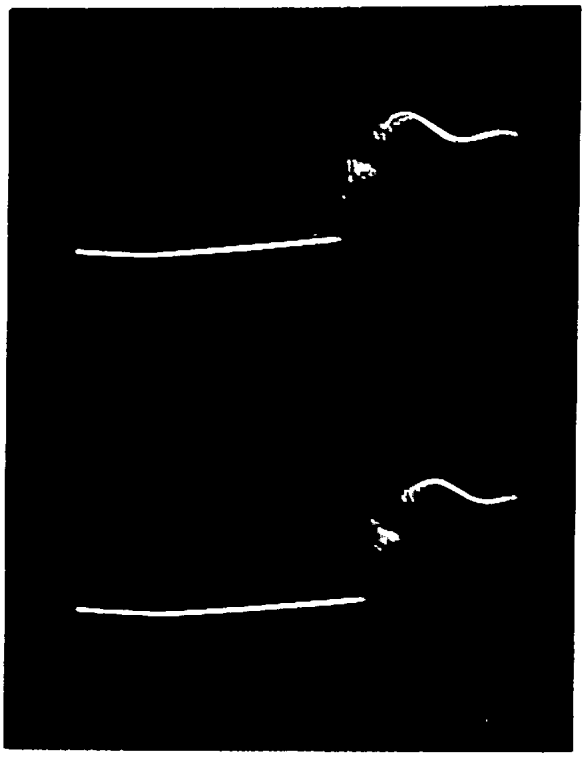
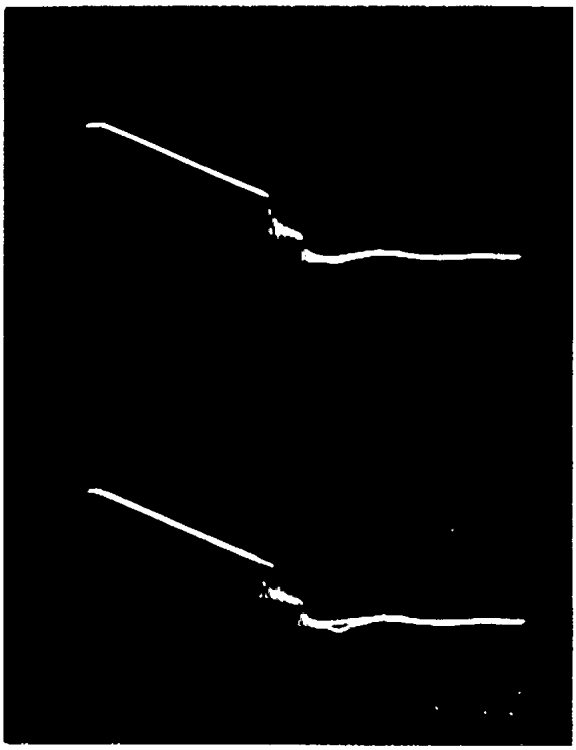


DETAIL OF LEADING EDGE OF WAVESHAPE
Prototype #1
No Load
Replacement Vibrator



DETAIL OF TRAILING EDGE OF WAVESHAPE
Prototype #1
No Load
Replacement Vibrator

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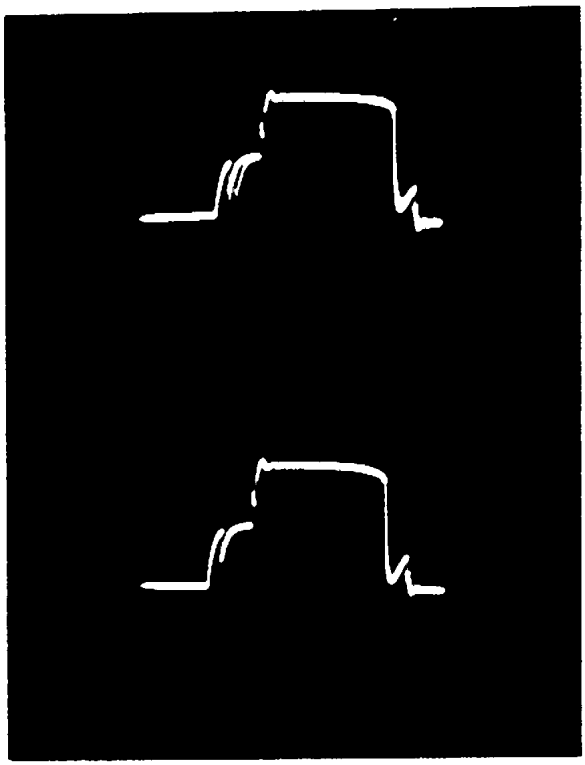
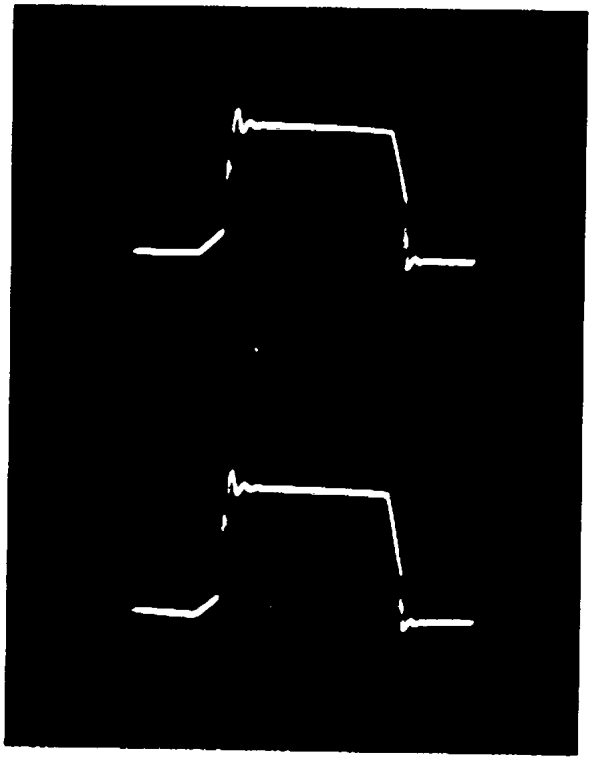


VOLTAGE WAVESHAPE
Prototype #2
60 Watt Load, Unity P.F.
Original Vibrator



VOLTAGE WAVESHAPE
Prototype #1
No Load
Replacement Vibrator

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